

Mikheylov, G. P.
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5448/8/8

81975

S/074/60/029/07/03/004

B020/B01

AUTHORS: Mikheylov, G. P., Sazhin, B. I.

TITLE: High-molecular Dielectrics 21

PERIODICAL: Uspekhi khimii, 1960, Vol. 29, No. 7, pp. 864-881

TEXT: The aim of the authors was to illustrate some laws governing the electric properties of polymers on the basis of own results and those published by other research workers. Attention is devoted chiefly to dielectric losses and polarization studied in dependence on the structure of high-molecular compounds with respect to chemical composition, stereochemical structure, amorphous and crystalline states, and also to the character of thermal motion, since the electric properties of the polymer are largely dependent on the last-mentioned characteristic. In the chapter dealing with dielectric losses and polymerization of non-polar polymers, the dependence of the dielectric constant ϵ' , the square of the refractive index n_D^2 , and the dielectric loss angle $\tan \delta$ on temperature and frequency (Fig. 1) for amorphous polystyrene, the

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High-molecular Dielectrics

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B020/B068

temperature dependence of ϵ' and $\tan\delta$ for atactic and isotactic polystyrenes (Fig. 2), of ϵ' and $\tan\delta$ for low- and high-density polyethylenes and polytetrafluoroethylene $\Phi-4$ (F-4) (Fig. 3), the dependence of $\tan\delta$ of high-and low-density polyethylenes on the concentration of the strongly polar $\text{C}=\text{O}$ groups (Fig. 4), the temperature dependence of $\tan\delta$ for polypropylene (Fig. 5) and polyethylenes at 3.10^9 cps are graphically shown. In Table 1, densities of non-polar polymers, their measured ϵ' -values as well as values of molecular polarization calculated from these densities and the refractions of bonds are given. The last column of this Table shows differences found between the experimentally determined and calculated polarization and refraction values. In the chapter dealing with dielectric losses and dielectric constants of polar polymers, the temperature dependence of ϵ' and $\tan\delta$ for polyparachlorostyrene (PPCS), polyvinyl chloride (PVC), polymonofluorotrichloroethylene ($\Phi-3$ (F-3)) (Fig. 7), and three crystalline polyesters (Fig. 8), of $\tan\delta$ for styrene - methylmethacrylate and styrene - methylacrylate copolymers

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High-molecular Dielectrics

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B020/B062

(Fig. 9), the frequency dependence of $\tan \delta$ for styrene - methyl-methacrylate copolymers (Fig. 10), the temperature dependence for acrylonitrile-butadiene¹ (26:74) and acrylonitrile - styrene (28:72) copolymers, of the relative volume changes for styrene - methyl-methacrylate copolymers (Fig. 12), of ϵ' and $\tan \delta$ for a polystyrene - benzylbenzoate mixture (Fig. 13), of $\tan \delta$ for a mixture of grafted polymers and homopolymers of acetobutyrate cellulose with polymethyl-methacrylate (Fig. 14), for polyethyleneterephthalate with nylon (Fig. 15), and the dependence of the logarithm of frequency of maximum $\tan \delta$ for dipole-elastic and dipole-radical losses on $1/T$ (Fig. 16) are graphically shown. In the chapter dealing with electrical conductivity and breakdown of polymers, the time dependence of the logarithm of the current flowing through the polymer with $U = \text{const}$ (Fig. 17), the temperature dependence of volume resistivity of PVC plasticized with 4.5% dioctylphthalate (Fig. 18), the dependence of the logarithm of volume resistivity of low-density polyethylene on $1/T$ (Fig. 19), the dependence of $\log \epsilon_{\text{vol}} = \varphi(1/T)$ for polyvinyl acetate, polyvinyl butyral, polyvinyl formal, polymethylmethacrylate, polyvinyl

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ethylal, and polystyrene (Fig. 20), the dependence of the electrical conductivity of polyethylene and polymethylmethacrylate on $1/T$ (Fig. 21), and the temperature dependence of the electrical conductivity of polyvinyl alcohol, polymethylmethacrylate, polyvinylchloroacetate, chlorinated high-density polyethylene, mica, polystyrene, high-density polyethylene, and polyisobutylene (Fig. 22) are graphically studied. A. F. Ioffe is mentioned. There are 22 figures, 2 tables, and 46 references: 26 Soviet, 12 US, 6 British and 2 German.

ASSOCIATION: Institut vysokomolekulyarnykh soyedineniy Akademii nauk SSSR (Institute of High-molecular Compounds of the Academy of Sciences, USSR). Nauchno-issledovatel'skiy institut polimerizatsionnykh plastmass, Leningrad (Scientific Research Institute of Polymer Plastics, Leningrad) X

Card 4/4

21136

15 8560 2209, 1372, also 1043, 1477

S/190/61/003/004/011/C14
B101/B207

AUTHORS: Kabin, S. P., Malkevich, S. G., Mikhaylov, G. P., Sazhin, B. I.
Smolyanskiy, A. L., Chereshevich, L. V.

TITLE: Study of the dielectric losses and polarization of some fluoro-
plasts

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 3, no. 4, 1961, 618-623

TEXT: This paper studies the effect of crystallization upon the dielectric
constant ϵ and $\tan \delta$ of the dielectric losses. Substances with the following
parameters were studied:

Substance:	Denotation	$d_{200}, g/cm^3$	$\epsilon, 10^5$ 0°C	cps, $\tan \delta, 10^5$ cps, 0°C	melting point, °C
polyvinylidene flu- oride	F-2	1.86	7.0	0.19	180
copolymer from tetra- fluoroethylene and fluorovinylidene 1:4	CF-1	1.86	6.4	0.18	145

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S/190/61/003/004/011/C14
B101/B2C7

Study of ...

Substance:	Denotation	$d_{200}, \text{g/cm}^3$	$\epsilon, 10^5$ 0°C	cps, $\tan \delta, 10^5$ cps, 0°C	melting point, °C
ditto, ratio 1:2	CF-2	1.91	8.6	0.09	160
ditto, ratio 1:1	CF-3	1.98	8.0	0.08	205

ϵ and $\tan \delta$ were measured between -150°C and melting point of the polymer at frequencies of $5-10^7$ cps on 0.1-0.5 mm thick samples according to a method described in Ref. 4 (G. P. Mikhaylov, B. I. Sazhin, Vysokomolek. soyed., 1, 9, 1959; Zh. tekhn. fiz., 25, 2186, 1955). The maximum error was less than 10%. Fig. 1 shows ϵ and $\tan \delta$ as a function of temperature. The maxima occurring therein which are caused by relaxation, were also observed when $\tan \delta$ was a function of frequency. Since tetrafluoroethylene has a symmetrical molecule with small dipole moment, the increase of ϵ and $\tan \delta$ in the copolymers, is due to the polarity of vinylidene fluoride. Three ranges of dielectric losses owing to relaxation were observed. 1) high-frequency relaxation at CF-2 and CF-3 in the range of from $-180- -100^\circ\text{C}$

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Study of ...

(maximum of $\tan \delta$); 2) medium-frequency relaxation in all substances investigated in the range of from -50 to $+50^\circ\text{C}$, and 3) low-frequency relaxation at $+100$ to $+200^\circ\text{C}$ in all substances. Experiments carried out with hardened CF-3 showed a falling of high-frequency relaxation and a rise of middle-frequency relaxation as compared to the non-hardened polymer. Fig. 4 shows the frequency of the maximum of high-frequency and medium-frequency relaxation as a function of $1/T$. The discussion of the experimental data led to the following conclusions: 1) The dielectric properties in the range of from 100 to 200°C cannot be explained by relaxation only. The structural transformations must also be taken into account. 2) The maxima of low-frequency relaxation lie close to the melting point of the polymers concerned, thus due to thermal motions in the crystalline phase. 3) The dielectric losses decrease with the degree of crystallization of the copolymers. 4) Orientation of polymers, i.e., increase of the degree of crystallization, may be accompanied by a considerable increase of ϵ . There are 4 figures, 1 table, and 11 references: 8 Soviet-bloc and 4 non-Soviet-bloc. The 2 references to English-language publications read as follows: M. E. Convoy et al., Rubb. Age, 76, 543, 1955; A. H. Willbourn, Trans. Faraday Soc., 54, 717, 1958.

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MIKHAYLOV, G.P.; IOBANOV, A.M.; SHEVELEV, V.A.

Temperature dependence of the dipole-elastic relaxation time of
polymers. Vysokom.soed. 3 no.5:794-797. My '61. (MIRA 14:5)

1. Institut vysokomolekulyarnykh soyedineniy AN S SSR.
(Polymers)

MIKHAYLOV, G.P., doktor fiziko-matematicheskikh nauk

Electric properties of polymers. Zhur.VKHO 6 no.4:404-411 '61.
(MIRA 14:7)
(Polymers--Electric properties)

25219

S/074/61/030/007/001/001
B117/B215

15.8540

AUTHORS: Mikhaylov, G. P., and Borisova, T. I.

TITLE: Study of molecular relaxation in polymers by the dielectric method

PERIODICAL: Uspekhi khimii, v. 30, no. 7, 1961, 895-913

TEXT: In the present paper, some conclusions are drawn on character and mechanism of relaxation on the basis of publications on the examination of relaxation processes in polymers by dielectric and mechanical methods. The relaxation observed by the dielectric method is characterized by the fact that the energy of the electric field applied to the polymer sample is mainly distributed by relaxants with polar groups. The molecular relaxation observed by the method of dielectric losses and polarization can be classified into two basic types: relaxation of polar radicals or of the monomer member of the macromolecule, and relaxation of the same radicals together with sections of the main chain, i.e., relaxation of sections. This was found for polymers of different structures: linear, ramified, structures with links in the chain, partly crystallized, and completely

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S/074, 61/010, 007/001/001
B117/B215

Study of molecular relaxation in

amorphous structures. Usually, it is assumed that the one type of relaxation in relation with the mobility of lateral polar radicals, the so-called dipole-radical losses, can only be observed within a certain temperature range which corresponds to the glass-like state of the polymer. The other type of relaxation, the so-called dipole-elastic losses, can only be observed in polymers above vitrification temperature. In the case of polymethyl methacrylate, the authors succeeded in observing dipole-radical losses at temperatures much higher than those of vitrification (Ref. 2: Polymer Sci., 30, 605 (1958); Ref. 3: ZhTF, 28, 132 (1958)). Hence, it may be assumed that dipole-radical losses are by no means restricted to the glass-like state of polymers since they have also been observed in the rubber-like state of polymers. Dipole-radical losses reflect the relaxation process caused by the motion of lateral polar groups. The main chain remains immovable during the examination. If the period of the applied field is long enough, dipole-elastic losses are observed at certain temperatures. They are due to the joint displacement of sections of the main chain and of polar side groups, i.e., they are related to the thermal motion of sections in the polymer. There are hardly any differences between the relaxation processes in ramified and nonramified polymers. This

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means that the kinetic units are much shorter than the distances between the points of ramification, and thus do not affect the mobility of the sections. According to publications, the relaxation time τ of dipole-elastic losses is prolonged by an extension of the polymer sample which causes an orientation of the main chain. Probably, this is no general rule. The change in the chemical structure of the monomer link of the polymer chain has an even higher effect on dipole-elastic losses than on dipole-radical losses. In this case, the introduction of polar and unpolar groups takes effect, which may be added directly to the main chain or to a lateral radical. In recent papers, much attention has been paid to the spectrum of the relaxation time. Unfortunately, the possibilities of applying this method are restricted to those cases where the shape of the distribution function of the relaxation time is independent of temperature. This is a prerequisite for this method. The effect of the structure of the macrochain on molecular relaxation becomes evident in the examination of dielectric properties of copolymers. The elasticity of the macrochain and also the character of molecular interactions may change if the percentage of the one or the other component of the copolymer is changed. This was observed during the examination of dielectric losses and polarization of

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B105/B206

Study of molecular relaxation in ...

copolymers, methyl methacrylate with styrene (Ref. 19: T. I. Borisova, G. P. Mikhaylov, Vysokomol. soyed., 1, 563, 574 (1959)), and methyl acrylate with styrene (Ref. 20: G. P. Mikhaylov, L. V. Krasner, ZhTF, 26, 1738 (1956)). The examination of molecular relaxation in isotactic polymethyl methacrylate and polystyrene by the method of dielectric losses showed that the steric regularity of the chain greatly changes the relaxation properties of polymers (Ref. 23: Authors, Vysokomol. soyed., 2, 619 (1960)). The temperature- and frequency dependences of dipole losses were studied in polyester on the basis of diene and some aliphatic and aromatic acids (Ref. 24: G. P. Mikhaylov, M. P. Eydel'vant, Vysokomol. soyed., 2, 287 (1960)). It is taken for granted that dipole-radical losses in mixed and in single-component esters are due to the relaxation of the polar COO group. The most probable relaxation time of this process is determined by the mobility of the chain segment directly adjacent to this group. The effect of the structure of the monomer link of the macromolecule on molecular relaxation of polymers was studied in the following polymers: polymethyl acrylate, polypropyl acrylate, poly- β -chloro-ethyl acrylate, polyvinyl acetate, polyvinyl butyrate, and poly- β -chlorovinyl propionate (Ref. 27: G. P. Mikhaylov, L. V. Krasner, v pechati (in print,

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Study of molecular relaxation in ...

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3105/3206

The results are given in Tables 4 and 5. V. A. Kargin, G. L. Slonimskiy, N. I. Shishkin, and P. F. Veselovskiy are mentioned. There are 17 figures, 5 tables, and 32 references: 20 Soviet-bloc and 12 non-Soviet-bloc.

ASSOCIATION: Institut vysokomolekulyarnykh soyedineniy AN SSSR (Institute of High-molecular Compounds AS USSR)

Legend of Table 4: Comparison of data on dipole-radical losses of isomeric polymers. (1) Structural formula of the polymer; (2) ГМА (PMA) polymethyl acrylate; (3) ППА (PPA) polypropyl acrylate; (4) 3-хлорэтил акрилат (P3KhEA) poly-β-chloro-ethyl acrylate; (5) ВВА (PVA) polyvinyl acetate; (6) ПВБ (PVB) polyvinyl butyrate; (7) 3-хлорвинил пропионат (P3KhLP) poly-3-chlorovinyl propionate.

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MIKHAYLOV, G.P.; BURSHTEYN, L.L.

Present-day theories of dipole polarization of condensed molecular
systems. Usp.fiz.nauk 74 no.1:3-30 My '61. (MIRA 14:6)
(Dipole moments) (Molecular dynamics)

33385

S/190/62/004/002/016/021

B110/B101

11.2210 also 2209

AUTHORS: Mikhaylov, G. P., Burshteyn, L. L

TITLE: Effect of side chain radical isomerism on the intramolecular interaction in polymers

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 4, no. 2, 1962, 270-275

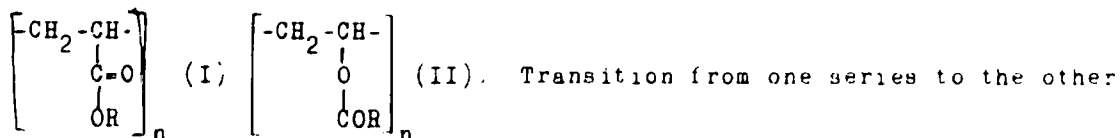
TEXT: P. Debey et al. (see below) observed in infinitely diluted polymers dissolved in unpolar solvents that the effective dipole moment of the monomeric link differed from the dipole moment of the isolated molecule since intramolecular interaction between the individual monomer links and orientation of polar groups take place in the isolated macrochain of the polymer. $\mu_{ef}^2 = \mu_o^2 \cdot ag$, where μ_o - dipole moment of the isolated monomeric link; g - parameter of the correlation of intramolecular interaction; a - factor to be estimated when observing the respective model. The molecular interaction on two homologous series of polyalkyl acrylates (I) and polyvinyl acetate (II) is studied by the method of effective dipole moments:

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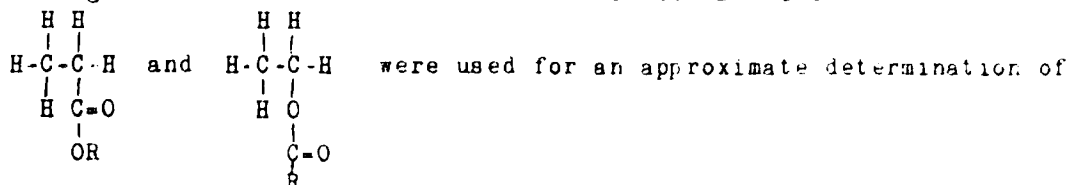
33385

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B110/B101

Effect of side chain radical



permits a study of intramolecular interaction due to different steric arrangements of the polar radicals: CH_3 , C_2H_5 , C_3H_7 , C_4H_9 . The investigation was conducted in benzene solution at 20°C



the dipole moment of the monomeric link. The concentration dependence (concentration of the polar substance $\leq 5\%$) of the dielectric penetrability (by means of MJE-1 (MLYe-1) bridge) and of the specific volume was determined for ascertaining the dipole moment. The dipole

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Effect of side chain radical

moments of the low-molecular analogs were calculated according to Lebye with extrapolation according to Kumler (see below) for infinite dilution. The basis therefor was the statistical polarization theory according to Bruckingham (see below). $d\epsilon/dx_2$ and dv/dx_2 are experimentally determined

The correlation parameter depends on the interaction energy μ_0 and the steric factor, i. e., the steric arrangement of the groups immediately adjacent to the polar radical. The dipole moment for compounds of the same series is similar, but differs on transition from I to II. The correlation parameter $g \sim 0.70$ for I, $g \sim 0.85$ for II, which confirms the change of intramolecular interaction. Since μ_0 is equal, this change is

due to different orientations of the polar groups to each other. In II, the decrease of intramolecular interaction is due to low correlation of the polar radical because of the flexible oxygen bond. Thus, the intramolecular interaction is determined by the dipole moment μ_0 and the

steric arrangement of the polar group in the polymer side chain. There are 6 tables and 6 references: 3 Soviet and 3 non-Soviet. The three references to English-language publications read as follows: P. Debey.

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33385

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B*10/B*01

Effect of side chain radical .

F. Bueche, J. Chem. Phys., 19, 589, 1951; J. Halverstadt, W. Kumler, J. Am. Chem. Soc., 64, 2988, 1942; A. D. Bruckingham, Proc. Roy. Soc., A 238, 235, 1956.

ASSOCIATION: Institut vysokomolekulyarnykh soyedineniy AN SSSR (Institute of High Molecular Compounds AS USSR)

SUBMITTED: February 11, 1961

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38291

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S/190/62/004/007/005/009
B110/B180

Author: Mikheylov, G. N., Krasner, L. V.

Title: Temperature dependence of dielectric losses in homologues of methyl acrylate and vinyl acetate polymers

Publication: *Spektr molekulyarnyye soyedineniya*, v. 4, no. 7, 1968, 1071-1075

Summary: The authors studied the effect of the structure of the side radicals in the polymer chain on $\tan \delta$ and ϵ' , together with the relaxation time τ , and the activation energy U of the dipole-radical and dipole-elastic processes. The measurements were made between -170 and +80°C, and 0.2 and 100 kc/s on polyethyl acrylate (1), polypropyl acrylate (2), polyvinyl propionate (3), polyvinyl butyrate (4), poly- β -chloro ethyl acrylate

$\text{—CH}_2\text{—CH—}$
 $\text{O=C—O(CH}_2\text{)}_2\text{Cl}$ (5), polyvinyl- β -chloro

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Temperature dependence of ...

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5119/3180

propionate $\text{—CH}_2\text{—CH—}$
 $\text{O=C—(CH}_2\text{)}_n\text{Cl}$ (6). Results: In this temperature

range, run 6 shows two maxima for all polymers, corresponding to the highly elastic and the brittle state of the polymer. If the polar side radical is bonded via an O atom to the polymer chain the \bar{U} and τ values will be higher than in the isomeric polymers with a C—O bond to the side radical (\bar{U} (in kcal/mole) for 1,3,2,4,5,6 is 8.2, 8.6, 5.7, 4.8, 5.0, 8.5 in the dipole-radical, and 39, 44, 33, 31, 40, 46 in the dipole-elastic process). In the dipole-radical process \bar{U} and τ fall as the number of CH_2 groups rises in the side radical (owing to the increased possibility of free rotation). Substitution of Cl for H in the CH_3 group of the side radical raises \bar{U} and τ in the dipole-radical process, and \bar{U} in the dipole-elastic process (owing to the increase in polarity of the polymer). There are 2 figures and 1 table.

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Temperature dependence of ...

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B119/B180

ASSOCIATION: Institut vysokomolekulyarnykh soyedineniy AN SSSR
(Institute of High-molecular Compounds AS USSR)

SUBMITTED: April 27, 1961

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S/130/62/004/007/006/009
B119/B180107 2250
107 2250

AUTHORS: Mikhaylov, G. P., Krasner, L. V.

TITLE: Effective dipole moments of homologous polymethyl acrylate
and polyvinyl acetate polymersPERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 4, no. 7, 1962,
1076-1083

TEXT: The effective dipole moments $\mu\sqrt{g}$ were determined for the vitreous and the highly elastic state of polymers, together with the relaxation time distribution parameters for polymethyl acrylate (1), polyethyl acrylate (2), polypropyl acrylate (3), polyvinyl acetate (4), polyvinyl propionate (5), polyvinyl butyrate (6), and also β -chloro substituted 3 (7) and 6 (8). The method of calculation has been described by the authors in Vysokomolek. soyed., 1, 542, 1959, and is based on $\tan \delta$ and ϵ' values measured between -170 and +80°C and 0.2 and 100 kc/sec. Results: In the substances investigated in the order 1,2,3,7,4,5,6,8 $\mu\sqrt{g}$ is 1.3, 1.8, 1.7, 2.3, 2.0, 2.0, 1.9, 3.6 D respectively. In the elastic state in the polymers of the polyvinyl acetate series in which the side

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Effective dipole moments of ...

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radical is bound via an O atom to the principal chain the dipoles show lower correlation to their surroundings than in those of the polymethyl acrylate series. On the other hand the correlation is greater in the vitreous state, which leads to lower μ^2/g values. Comparison of temperature coefficients and volume expansion of the polymers showed that they were higher in the polyvinyl acetate than in the polymethyl acrylate series, and that their ratio was constant for individual homologs. This suggests a relationship between the temperature dependence of the specific volume and the breadth of the relaxation times spectrum. There are 7 figures and 3 tables. The most important English-language references are: D. N. Davidson, R. H. Cole, J. Chem. Phys., 19, 1484, 1951. F. Harris. B. Alder, J. Chem. Phys., 21, 6, 1953. R. Fuoss, J. Kirkwood, J. Amer. Chem. Soc., 63, 369, 1941.

ASSOCIATION: Institut vysokomolekulyarnykh soyedineniy AN SSSR
(Institute of High-molecular Compounds AS USSR)

SUBMITTED: April 27, 1961

Card 2/2

S/190/62/004/010/005/010
B101/B186

AUTHORS: Borisova, T. I., Burshteyn, L. L., Mikhaylov, G. P.

TITLE: Synthesis and examination of the structure of catalytic poly-n-butyl methacrylate. III. Possibility of estimating the stereoregularity of the polymer by studying the dielectric loss and polarization

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 4, no. 10, 1962, 1479-1485

TEXT: poly-n-butyl methacrylate (PBMA) samples having different steric structures were used to determine $\tan \delta$ and ϵ' in bulk and in solution between 20 cps and 150 kcps, and $-60 - +100^\circ\text{C}$. The differences in the course of the curves $\tan \delta$ versus T ($^\circ\text{C}$) at 20 cps for atactic, syndiotactic, and isotactic PBMA (Fig. 1) is explained by a reduction in the probable relaxation time τ of the dipole-elastic process for isotactic PBMA owing to increased mobility of the chain segments. As samples with different steric structures had the same density ($1.06-1.07 \text{ g/cm}^3$), this increase in mobility is not attributable to loosening of structure but to weakened intramolecular correlation of the polar groups. From the Card 1/1.3

Synthesis and examination of ...

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function $\log f_m = \varphi(1/T)$, where f_m = the temperature coefficient of $\tan \delta_{\max}$, the apparent activation energy of the dipole-elastic loss is calculated to be 38 kcal/mole for atactic, 35 kcal/mole for syndiotactic, and 29 kcal/mole for isotactic PBMA, the vitrification temperatures being respectively 28, 21, and -14°C. Between 20 and $1.5 \cdot 10^5$ cps, the dipole-radical loss showed no maximum in the whole temperature range studied. The linear dependence specific volume versus concentration was the same in all samples. For isotactic PBMA, the dipole moment $\mu_0 \sqrt{E}$ was 1.52, and

for syndiotactic PBMA 1.45 debye. Since the above mentioned samples contained alternating sections with isotactic and irregular structures, it is concluded that the difference in dipole moments increases with the content of isotactic structure. The following formula is suggested for estimating the microtactic structure:

$P_{\text{sample}} = (1 - x_2)P_1 + x_2P_2$, where P_{sample} = polarization of the sample studied, x_2 = concentration of the polymer portion with regular structure, P_1 and P_2 = polarization of the irregular and isotactic polymer,

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Synthesis and examination of ...

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B101/B186

respectively, and $P \sim \mu_{\text{eff}}^2 / 3kT$. There are 4 figures and 2 tables.

ASSOCIATION: Institut vysokomolekulyarnykh soyedineniy AN SSSR
(Institute of High-molecular Compounds AS USSR)

SUBMITTED: June 7, 1961

Fig. 1: $\tan \delta$ versus temperature at 20 cps. (1) atactic PBMA;
(2) isotactic PBMA; (3) and (5) syndiotactic PBMA.

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S/190/62/004/011/012/014
B101/B144

AUTHORS: Mikhaylov, G. P., Borisova, T. I.

TITLE: Mobility of polyhalogen styrene macromolecules I. Investigation into the form of the molecular motion of poly-2-fluoro-5-methyl styrene by dielectric losses and polarization

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 4, no. 11, 1962, 1732-1738

TEXT: $\tan \delta$ and ϵ' of poly-2-fluoro-5-methyl styrene (PFMS) were measured between -160 and +165°C and at 15 - 150,000 cps. At low temperatures no dielectric loss of dipole-type was observed. At 115 - 120°C $\tan \delta(t)$ passes through a maximum. The asymmetrical temperature dependence of $\tan \delta$ proved the existence of dipole-elastic and dipole-radical losses. Only at frequencies less than 1 cps is it possible to observe $\tan \delta_{\max}$ of the two losses directly and separately. The phenyl group side radicals of PFMS have a certain mobility which is rather independent of the main chain also in the glassy state. Above 120°C the motions of the side radicals combine with those of the macrochains to form a single molecular relaxation process.

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Mobility of polyhalogen ...

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$\log f_{\max} = -A(1/T)$ where the apparent activation energy of this process decreases from 90 kcal/mole at 100°C to 45 kcal/mole at 160°C. Above 110°C μ_0 approaches the constant value of ~ 1.45 Debye. There are 7 figures and 1 table.

ASSOCIATION: Institut vysokomolekulyarnykh soyedineniy AN SSSR (Institute of High-molecular Compounds AS USSR)

SUBMITTED: July 14, 1961

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S/032/62/028/002/028/037
B124/B101

AUTHORS: Mikhaylov, G. P., Snevelev, V. A., and Dmitrochenko, D. A.

TITLE: Device for measuring dielectric losses and dielectric constant of solid polymer dielectrics

PERIODICAL: Zavodskaya laboratoriya, v. 18, no. 1, 1961, 234-236

TEXT: ϵ' and $\tan \delta$ can be measured in a wide temperature range with a setup based on the standard measuring device. The measuring circuit was connected with the standard-signal generator FCC-17 (300-17) through attenuator AC-1 (AS-1) and YP-1A (UR-1A) or YP-2 (UR-2) broad-band amplifier. The measuring amplifier 8MM (20.15) was used as resonance indicator. The resonance frequency was checked with a YBP- (UVR) wavemeter. The first modification of the measuring circuit, shown in Fig. 1, a, is designed for use in a wide temperature range. The dielectric sample is placed into the gap of measuring capacitor 2 containing no mobile electrodes. Insulation 3 is made of a high-frequency ceramic material. Thermostat 5 ensures constant temperature of loop 6, induction coil 7, detector crystal 8, and screen 9. The second modification, shown Card 1/3.

Device for measuring dielectric losses ... Fig. 1,6

in Fig. 1,6, is designed for measurements at room temperature, with trimming condenser 10 being as close as possible to the gap of the measuring capacitor, thereby permitting accurate measurement of the sample capacitance. Plane parallel sample disks with a thickness of 0.001 to 0.005 mm in excess of that of the gap between the electrodes were used, the diameter of which was calculated from $D_0 \ll D = 1.14d$, where D_0 is the diameter of the sample, D is that of the electrodes, and d is the thickness of the sample. With the first modification, ϵ' is found from the change of resonance frequency after the introduction of the sample into the gap

of the measuring capacitor, i. e., from $\epsilon' = (C_n/C_0) \left[(f_1/f_2)^2 - 1 \right] + (f_1/f_2)^2$;

$\tan \delta = \left[1 + (C_n/\epsilon' C_0) \right] \cdot \left[(1/\alpha_2) - (1/\alpha_1) \right]$; $C_0 = D_0^2/16d$, and $C_n = C - C_0$, where C is the total capacitance of the circuit, f_1 and f_2 are the resonance frequencies in the absence and presence of the sample, α_1 and α_2 are the efficiencies of the circuit in the absence and presence of the

Card 2/8.

Device for measuring dielectric losses ...

3/032/62/028, 002, 028, 037
B:24/B10'

sample at the frequency f_2 . By comparison with a standard polyethylene sample C_n/C_0 was found to be about 10%. For the second modification, $\epsilon' = (\Delta C/C_0) + 1$, and $\tan \delta = \frac{\Delta C_2 - \Delta C_1}{2(\Delta C + C_0)}$, where ΔC is the change of total capacitance of the circuit with the sample introduced; ΔC_1 and ΔC_2 are the capacitances corresponding to the width of the resonance curve of the circuit in the absence and presence of the sample. Corrections are made for the change of inherent resonance frequency f_1 of the circuit in the absence of the sample, and for its efficiency η_1 , at high and low temperatures. ϵ' between 2 and 4 and $\tan \delta$ between $5 \cdot 10^{-4}$ and 10^{-1} can be measured with a relative error of less than 2% and 10 to 15%, respectively. The error depends on the dielectric losses in the dielectric. The relative changes due to this factor are less than 1% for ϵ' , and 3 to 5% for $\tan \delta$. Results obtained for the temperature dependence of polyvinyl acetate, polyethylene terephthalate, and polymethyl methacrylate at 40 Mc/sec agree well with experimental data of other authors. There are

Card 3/8.

Device for measuring dielectric losses ...

5/032/62/028/032/028/037
B124/B101

2 figures and 9 references: 6 Soviet and 3 non-Soviet. The two references to English-language publications read as follows: ASTM, D150-54T; W. Reddish, Transactions of the Faraday Society, 46, 459 (1950). ✓

ASSOCIATION: Institut vysokomolekulyarnykh soyedineniy Akademii nauk SSSR
(Institute of High-molecular Compounds of the Academy of Sciences USSR)

Fig. 1. Schematic diagram of the measuring circuits. Legend: (A) water.

Card 4/8.

TAGER, Anna Aleksandrovna. Prinimali uchastiye: TSVANKIN, D.Ya.;
BORISOVA, T.I.; BURSHTEYN, L.L.; SLINKIN, A.A.; DULOV, A.A.;
MIKHAYLOV, G.P., red.; ROGAYLINA, A.A., red.; SHPAK, Ye.G.,
tekhn. red.

[Physical chemistry of polymers] Fiziko-khimiia polimerov.
Moskva, Goskhimizdat, 1963. 528 p. (MIRA 16:12)
(Polymers)

ACCESSION NR: APL025096

S/0139/63/000/006/0129/0134

AUTHORS: Meshcheryakov, R. P.; Mikhaylov, G. P.

TITLE: Effect of a surface charge on photomultiplier operation

SOURCE: IVUZ. Fizika, no. 6, 1963, 129-134

TOPIC TAGS: photomultiplier operation, impulse regime, oscillogram, blanketing pulse, scintillation spectrometer, loading characteristic, divider current

ABSTRACT: A detailed review of experimental analyses on photomultiplier operations has been presented along with some additional investigations by the authors. The study includes operation in the impulse regime of several photomultipliers (FEU-13B, FEU-11B, FEU-12B, and FEU-29) as recorded on oscillograms. The characteristics of the recorded curves seem to be independent of both the operation region of the photomultipliers and the method of pulse feed generation. The inertia in photomultipliers is discussed, and the necessity of increasing the blanketing pulse duration is considered. The operation of photomultipliers at various counter speeds is investigated in the scintillation spectrometer regime with NaI(Tl) crystals, using two sources of Co^{60} (1 and 0.03 μ curie activity). The loading

Card 1/2

ACCESSION NR: AP4025096

characteristics are displayed graphically, and they show no dependence on the intercascade divider current. Finally, the volt-ampere characteristics are measured at 8×10^2 and 2×10^4 imp/sec counter speeds. Orig. art. has: 6 figures.

ASSOCIATION: NII pri Tomskom politekhnicheskom institut imeni S. M. Kirova (NII, Tomsk Polytechnical Institute)

SUBMITTED: 18May62

DATE ACQ: 14Feb64

ENCL: 00

SUB CODE: GE

NO REF SOV: 011

OTHER: 004

Card 2/2

ACCESSION NR: AT4034003

S/0000/63/000/000/0175/0180

AUTHOR: Mikhaylov, G. P.; Lobanov, A. M.

TITLE: Dielectric properties of polydiansebaccinate in the ultra-high frequency range

SOURCE: Geterotsepnyye vy*sokomolekulyarnyye soyedineniya (Heterochain macromolecular compounds); sbornik statey. Moscow, Izd-vo "Nauka," 1963, 175-180

TOPIC TAGS: polymer, polycondensate, amorphous polycondensate, polydiansebaccinate, polymer dielectric property, polydiansebaccinate dielectric property, polymer polarization, dipole radical loss, dielectric high frequency behavior, dielectric high temperature behavior

ABSTRACT: The dielectric properties of polydiansebaccinate, a polar amorphous polycondensate with a vitrification temperature of 26C, were studied at frequencies of $2 \cdot 10^2$ - 10^{10} cps and temperatures of -150 to +200C. Results are presented graphically (see Fig. 1 in the Enclosure) and indicate that the dielectric properties at ultra-high frequencies are governed by dipole-radical losses. Dipole-elastic losses were not observed in this polymer above 10^8 cps. The possibility of simultaneous occurrence of two absorption areas, corresponding to dipole-radical and dipole-elastic losses, at a given temperature above the glass temperature was established

Card 1/3

ACCESSION NR: AT4034003

and attests to coexistence of two types of polarization at a given temperature. "In conclusion, the authors express gratitude to Zh. S. Sogomonyanets for polymer synthesis and N. M. Starostina for participation in the measurements." Orig. art. has: 3 graphs.

ASSOCIATION: Institut vyssokomolekulyarnykh soedineniy AN SSSR (Institute of High Molecular Weight Compounds AN SSSR)

SUBMITTED: 16Nov62

DATE ACQ: 30Apr64

ENCL: 01

SUB CODE: OC

NO REF SOV: 008

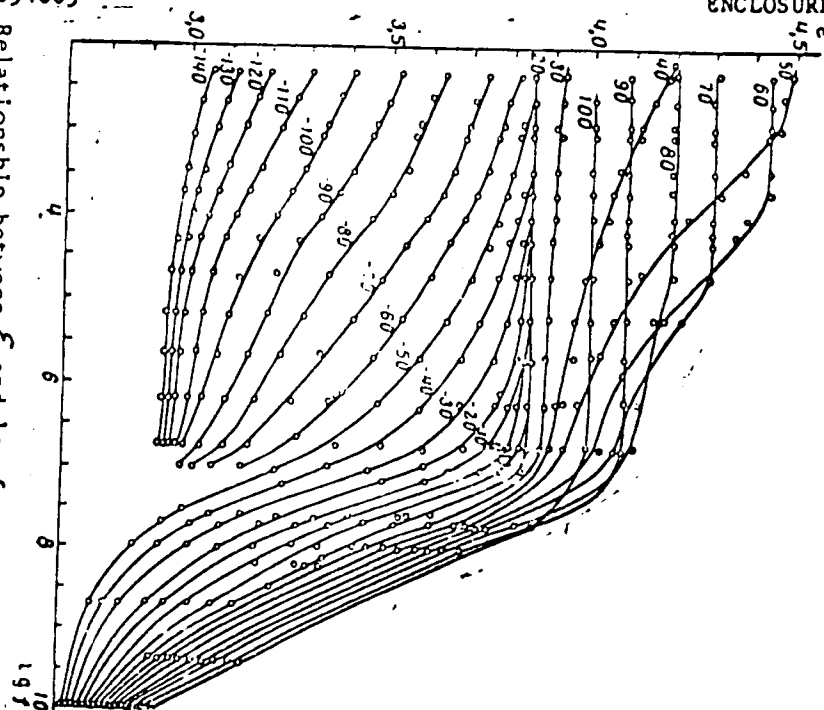
OTHER: 001

Card 2/3

ACCESSION NR: AT4034003

ENCLOSURE: 01

Relationship between ϵ' and $\log f$
(the numbers indicate temperature
in °C)



Card 3/3

ACCESSION NR: AT4034004

S/0000/63/000/000/0181/0185

AUTHOR: Mikhaylov, G. P.; Lobanov, A. M.

TITLE: Calculation of some molecular parameters from data obtained in studies of dipole polarization in polydiansebaccinate

SOURCE: Geterotsepnnyye vyssokomolekulyarnyye soyedineniya (Heterochain macro-molecular compounds); sbornik statey. Moscow, Izd-vo "Nauka," 1963, 181-185

TOPIC TAGS: dipole polarization, polymer polarization, polydiansebaccinate, polymer dielectric property, dielectric loss, dipole radical loss, dielectric high temperature behavior, dielectric polymer, specific dipole moment, circular graph method

ABSTRACT: A circular graph procedure (see Fig. 1 in the Enclosure) was used in analyzing experimental data on the dielectric properties of polydiansebaccinate to evaluate qualitatively the relaxation period distribution parameter, specific dipole moments, and the magnitudes of $\Delta\epsilon = \epsilon_0 - \epsilon_\infty$ (where ϵ_0 and ϵ_∞ are equilibrium values of the dielectric constant) and ϵ''_{\max} . The results indicate that the dielectric properties of polydiansebaccinate are governed at high temperatures by dipole-radical polarization, i.e. only kinetic units (determining dipole-radical losses) participate in the thermal motion under such conditions (above 40°C).

Card 1/3

ACCESSION NR: AT4034004

The increase in ϵ''_{max} of dipole-radical losses with temperature is due to narrowing of the relaxation period spectrum and an increase in the specific dipole moment. Dipole-radical losses cannot be described in terms of the theory of dielectrics suggested by G. Frel'kh (Teoriya dielektrikov. Izd. In. Lit., 1960). Orig. art. has: 5 graphs and 3 formulas.

ASSOCIATION: Institut vyssokomolekulyarnykh soedineniy AN SSSR (Institute of High Molecular Weight Compounds AN SSSR)

SUBMITTED: 16Nov62

DATE ACQ: 30Apr64

ENCL: 01

SUB CODE: OC

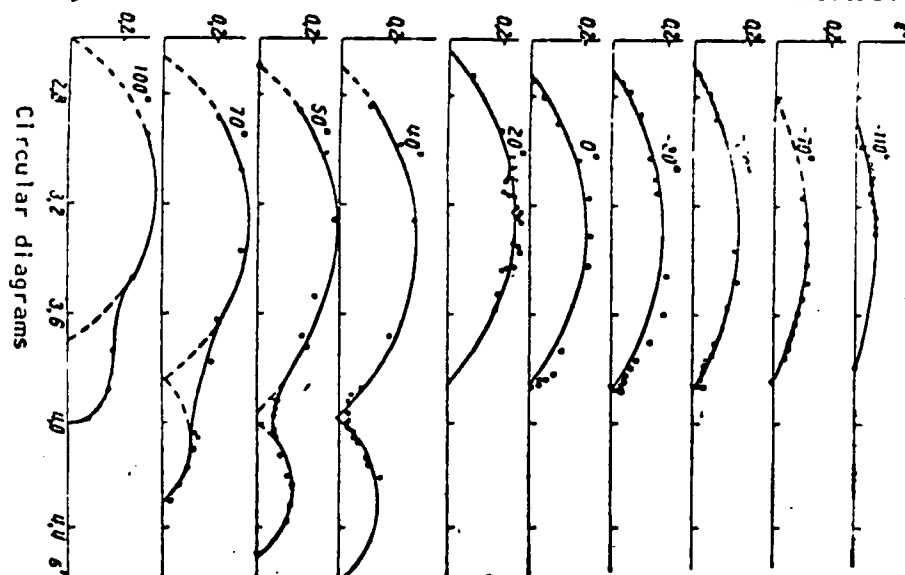
NO REF SOV: 001

OTHER: 006

Card 2/3

ACCESSION NR: AT4034004

ENCLOSURE: 01



Card 3/3

ACCESSION NR: AP3003797

S/0190/63/005/007/1085/1090

AUTHORS: Mikhaylov, G. P.; Krasner, L. V.

TITLE: Temperature and frequency dependence of dielectric losses in styrene methacrylate and styrene methyl vinyl ketone copolymers. 1

SOURCE: Vy*sokomolekulyarny*ye soyedineniya, v. 5, no. 7, 1963, 1085-1090

TOPIC TAGS: styrene methacrylate, styrene methyl vinyl ketone, dielectric loss, temperature, frequency dependence, dipole elastic effect, dipole radical effect

ABSTRACT: Copolymerization was effected at low conversion (about 10%) for all concentrations, in order to obtain statistical distribution of components in the macromolecule. The concentration of the polar component was determined by chemical analysis for oxygen content. The copolymers were prepared by G. A. Petrova in the laboratory of Professor A. A. Vansheydt. The samples were prepared as described in a previous work by T. I. Borisova and G. P. Mikhaylov (Vy*sokomolek. soyed., 1, 574, 1959), and measurements were made in the frequency range 20 to 100 000 cycles at temperatures from -120 to +130°. Measurements show that all the investigated polymers, on being heated, pass through two regions where dielectric loss reaches a maximum (as is true of all single-component polar polymers). Maxima of dielectric
Card 1/2

ACCESSION NR: AP3003797

loss shift toward higher temperatures with increase in styrene content, but the value of the loss and the value of activation energy decline. With change in concentration the activation energy changes according to the polar component till the value corresponding to polystyrene is reached. Results show that dipole-radical relaxation time does not change with concentration, but dipole-elastic relaxation time does. Frequency dependence shows a gradual change from a simple relation in dipole-radical relaxation to a complex relation in dipole-elastic relaxation. Orig. art. has: 6 figures.

ASSOCIATION: Institut vysokomolekulyarnykh soedineniy AN SSSR (Institute of High-Molecular Compounds, AN SSSR)

SUBMITTED: 10Jan62

ENCL: 00

SUB CODE: MT

NO REF SOV: 006

OTHER: 002

Card 2/2

MIKHAYLOV, G.P.; KHASNER, L.V.

Effective dipole moments of styrene-methacrylate and styrene-methyl vinyl ketone copolymers. Part 2. Vysokom.soeed. 5 no.7: 1091-1095 J1 '63. (MIRA 16:9)

1. Institut vysokomolekulyarnykh soyedineniy AN SSSR.
(Styrene polymers—II, dipole moments)

L 18123-63

EPR/EWP(j)/EPF(c)/EWT(m)/BDS ASD/ESD-3 Ps-4/Pc-4/Pr-4 RM/WW/RH/MAY

ACCESSION NR: AP3003889

S/0181/63/005/007/1917/1923

AUTHORS: Mikhaylov, G. P.; Lobanov, A. M.

TITLE: Molecular relaxation in polymers at temperatures considerably above vitrification

SOURCE: Fizika tverdogo tela, v. 5, no. 7, 1963, 1917-1923

TOPIC TAGS: molecular relaxation, polymer, vitrification, polymethyl acrylate, polydian sebacate, polyvinyl acetate, polyvinyl chloride, dielectric dipolar polarization, dielectric constant

ABSTRACT: The authors have investigated the molecular relaxation in polymethyl acrylate, polydian sebacate, polyvinyl acetate, and polyvinyl chloride by the dielectric method at temperatures 50-100C above vitrification. It was found that only dipole-radical polarization occurred in polymers during investigation of molecular relaxation at high temperatures. The temperature dependence of relaxation frequencies was found to agree with extrapolated values for dipole-radical relaxation. Computed values for time distribution of relaxation at high temperatures agree with determinations made for the temperature interval in which dipole-radical loss is not superposed on dipole-elastic loss. The temperature dependence of the dielectric

Cord 1/2

L 18123-63

ACCESSION NR: APX003889

constant attests to a definite contribution of dipole-radical polarization at high temperatures. The contribution of dipole-elastic polarization tends toward zero at high temperatures. All the experimental data indicate that at temperatures above vitrification only dipole-radical relaxation is observed. That is, under the indicated conditions, only kinetic units on the order of monomer units participate. The macromolecules are very flexible, and the principal type of thermal movement in the polymers is intramolecular. Orig. art. has: 5 figures.

ASSOCIATION: Institut vy*sokomolekulyarny*kh sovedineniy AN SSSR, Leningrad
(Institute of High-Molecular Compounds, Academy of Sciences, SSSR)

SUBMITTED: 25Feb63

DATE ACQ: 15Aug63

ENCL: 00

SUB CODE: FM, MA

NO REF SOV: 006

OTHER: 007

Card 2/2

MIKHAYLOV, G.P.; SMOLYANSKIY, A.L.

Use of infrared spectra in the study of molecular interaction in
polymers and their hydrated monomers. Part 1: Hydrated monomers
and copolymers. Opt. i spektr. 15 no.4:471-477 0 '63.

(MIRA 16:11)

ACCESSION NR: AP4009459

S/0051/63/015/006/0766/0771

AUTHOR: Mikhaylov, G.P.; Smolyanskiy, A.L.

TITLE: Investigation of molecular interaction in polymers and their hydrogenated monomers by observation of infrared spectra. 2. Polymers

SOURCE: Optika i spektroskopiya, v.15, no.6, 1963, 766-771

TOPIC TAGS: infrared spectrum infrared absorption, carbonyl group, polymethylacrylate, polyethylacrylate, polybutylacrylate, polymethylmethacrylate, polyethylmethacrylate, polybutylmethacrylate, polyvinylacetate, molecular interaction, hydrogenation, polymer chain, polymer linkage, ester group.

ABSTRACT: In the preceding paper by the authors (G.P. Mikhaylov and A.L. Smolyanskiy, Opt. i spektr. 15, 471, 1963) there were presented the results of investigation of the absorption band of the carbonyl group in a number of esters representing hydrogenated acrylates and methacrylates and copolymers of these with styrene. It was shown that the changes in the spectra parameters of the C=O absorption band in going from the hydrogenated monomers to the copolymers, in which the concentration of ester groups approaches zero, are not connected with specific differences between the

Card ^{1/3} ~

AP4009459

monomer links in the copolymer chains from small molecules, i.e., from molecules of hydrogenated monomers. The present work was devoted to investigation of the molecular interaction in acrylate and methacrylate polymers and polyvinyl acetate. To this end there were investigated the infrared absorption bands of the carbonyl group with the polymers in the bulk state and in benzene and chloroform solutions. The variations in the spectra are described and the spectral parameters of the C=O band ($\sim 1730 \text{ cm}^{-1}$) are tabulated. The molecular interaction in the polymers is discussed on the basis of comparison of the spectra parameters of the C=O band of the polymers with the spectral characteristics of the band in the spectra of the corresponding hydrogenated monomers and copolymers with styrene. It is concluded that the alterations observed in the spectra are due to the influence of the force field of the monomer link in the polymer chain on the vibrations of the carbonyl group. The results of the investigation are in agreement with the data of other studies of the same systems by the method of dielectric polarization and measurement of dipole moments. "In conclusion we desire to express our deep gratitude to L.L.Burshteyn, G. S.Denisov and V.N.Nikitin for their constant interest in the work and discussions." Orig.art.has: 3 formulas, 3 figures and 2 tables.

Card 2/2

Sub 24 Mar 63

MIKHAYLOV, G. P.

"The dielectric losses and the polarization of organic polymers in connection with their composition."

report submitted to Intl Conf on the Physics of Non-Crystalline Solids, Delft, Netherlands, 6-10 Jul 64.

ACCESSION NR: AP4012183

S/0191/64/000/002/0009/0012

AUTHORS: Mikhaylov, G. P.; Lobanov, A. M.; Shevelev, V. A.; Orlova, T. P.

TITLE: Dependence of $\text{tg}\delta$ and ϵ' of polyethylene on temperature in the range of ultra high frequencies

SOURCE: Plasticheskiye massy*, no. 2, 1964, 9-12

TOPIC TAGS: polyethylene, ultra high frequency relaxation, high frequency relaxation, dipole losses. testing of plastic

ABSTRACT: For polyethylene rolled more than one hour at 160 C a field of maximum $\text{tg}\delta$ at a frequency of 10^9 hertz is observed at room temperature. At frequencies of 3×10^7 and 4.7×10^8 hertz, $\text{tg}\delta$ of polyethylene at temperature intervals of -60C to +160C passes through a peak zone three times; two types of losses at these two frequencies can be attributed to losses of mean frequency and high frequency relaxation, combined with orientational polarization in amorphous zones of polyethylene. Also at these frequencies new dipole losses appeared which are not to be attributed to three previously known

Card 1/2

ACCESSION NR: AP4012183

types of losses in polyethylene. It is also observed that during heat treatment of low density polyethylene in the presence of atmospheric oxygen, $\tan \delta$ in a maximum field at specified frequencies increases proportionally with time. In these specimens of polyethylene one wide field of $\tan \delta$ appears as a result of application of the three types of losses noted in the original polyethylene. Uneven changes typical of dipole polarization were observed first at temperature dependence ϵ' of polyethylene. In polyethylene at room temperature, $\tan \delta$ passes through the maximum field in the vicinity of frequency 4.7×10^8 hertz. The amount of $\tan \delta_{\max}$ is extremely sensitive to the content of polar additions combined with macromolecules. This work served for a period as one of the foundations for recommendations for the All Union State Standard for testing of plastics at a frequency of 4.7×10^8 hertz. Orig. art. has: 4 Figures

ASSOCIATION: None

SUBMITTED: 00

DATE ACQ: 26Feb64

ENCL: 00

SUB CODE: MA

NR REF SOV: 015

OTHER: 005

Card 2/2

MIKHAYLOV, G.P.; BORISOVA, T.I.

Molecular motion in polymers. Usp. fiz. nauk 83 no. 1:63-79
My '64. (MIRA 17:6)

MIKHAYLOV, G.P.; LOBANOV, A.M.; CHEVCHENOV, V.I.; KALVA, T.I.

Dependence of $\tan \delta$ and ϵ' of polyethylene on the temperature
in the ultrahigh frequency range. Mas. nauky no.2:9-12 '64.
(MIRA 17:8)

SAZHIN, Boris Ivanovich; MIKHAYLOV, G.P., prof., red.; SHUR, Ye.I.,
red.

[Electric conductivity of polymers] Elektroprovodnost'
polimerov. Moskva, Izd-vo "Khimiia," 1964. 115 p.
(MIRA 17:6)

AL-HAYLOV, Ali. HANOV, A.M.; EL. M., H.A.; CHLOVA, T.

Temperature dependence of ϵ' and δ of polyfluoromethane
4,7,11-tris. Vysokom.sobit. d. n. 5:808-870 My '64.
(MVA 1964)

1. Institut vysokomolekulyarnykh soedineniy AN SSSR.

ACCESSION NR: AP4037283

8/0190/64/006/005/0868/0870

AUTHORS: Mikhaylov, G. P.; Lobanov, A. M.; Shevelev, V. A.; Orlova, T. P.

TITLE: The relation between epsilon prime and tan delta of Teflon and temperature at the frequency of $4.7 \cdot 10^8$ cycles per second

SOURCE: Vy*sokomolekulyarny*ye soyedineniya, v. 6, no. 5, 1964, 868-870

TOPIC TAGS: polytetrafluorethylene, Teflon, epsilon prime Teflon, tan delta Teflon

ABSTRACT: Measurements obtained using the method described by D. A. Dmitrochenko, A. M. Lobanov, G. P. Mikhaylov, and V. A. Shevelev (Zavodsk. lab., 1959, No. 9, 1121) are presented on Fig. 1 of the Enclosures. Here curves 1, 1', 5, and 6 pertain to the original annealed Teflon samples, curves 2 and 2' to the hardened samples, curves 3 and 3' to the compressed samples, and curves 4 and 4' to samples cut from the necked portion of samples subjected to tension. The low concentration of admixtures is probably responsible for the absence of $\tan \delta$ maximum at 323K on curve 6. The increase of $\tan \delta_{\max}$ in hardening indicates that the observed losses are related to orientation processes in the amorphous phase of the polymer. The value of ϵ' diminished during hardening, compressing, and

Card 1/5

ACCESSION NR: AP4037283

elongating of the samples. Figure 2 of the Enclosures shows the relations between the logarithm of frequency and the reciprocal temperature at which $\tan \delta_{\max}$ is constant. The activation energy calculated from the straight line segments of this curve is equal to 18.5 kcal/mole and 12 kcal/mole (below and above 248K, respectively). Orig. art. has: 2 graphs.

ASSOCIATION: Institut vyssokomolekulyarnykh soyedineniy AN SSSR (Institute of High-Molecular Compounds, AN SSSR)

SUBMITTED: 10Jun63

/ ENCL: 03

SUB CODE: GC

NO REF SOV: 003

OTHER: 015

Card 2/5

ACCESSION NR: AP4037283

ENCLOSURE: 01

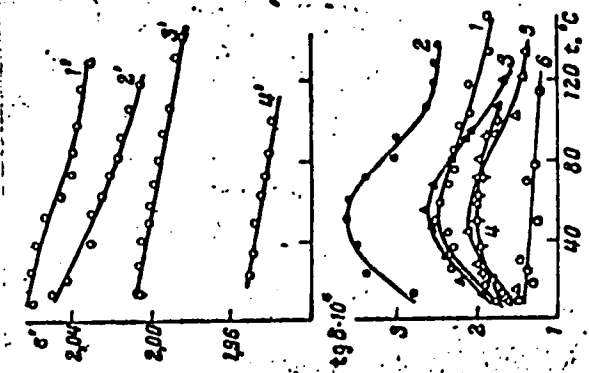


Fig. 1. Relation of ϵ' and $\tan \delta$ of Teflon to temperature at the frequency of 4.7×10^8 cps.

3/5

Card

ACCESSION NR: AP4037283

ENCLOSURE: 02



Card 4/5

ACCESSION NR: AP4037283

ENCLOSURE: 03

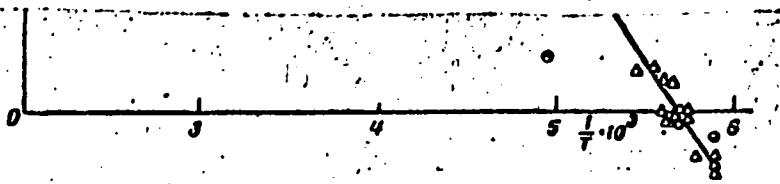


Fig. 2. Relation of $\log f_m$ to $1/T$ for Teflon.

Mechanical determinations: a - [2, 3]; δ - [7]; B - [8, 9];
 2 - [10, 12]; ∂ - [13]; e - [14]; Ж - [15]; 3 - [16];
 u - [11]. Dielectrical determinations: 1 - [2, 3]; 2 - [4];
 3 - [5, 6, 7]. Data obtained with the method used by R. K. Eby
 and K. M. Sinnott (J. Appl. Phys., 32, 1756, 1961) and by J. G.
 Powlès and J. A. Kail (J. Polymer Sci., 31, 183, 1958).

5/5

Card

MIKHAYLOV, G.P.; BURSHTEYN, I.I.

Dipole moments of stereoregular tertiary polybutyl methacrylate. *Vysokom. soed.* 6 no.9:1713-1716 S '64. (MIRA 17:10)

1. Institut vysokomolekulyarnykh soyedineniy AN SSSR.

L 10757-65 EWT(m)/EPF(c)/EPR/EWP(j)/T Pc-l/Pr-l/Ps-l RPI/ESD(t)/ASD(a)-5/
ESD(ga)/AS(mp)-2/SSD/AFWL/AFETR RM/MM
ACCESSION NR: AP4047201 S/0190/64/006/010/1778/1784

AUTHOR: Mikhaylov, G. P.; Borisova, T. I.

TITLE: Some characteristics of the dipole elastic losses in polymers in relation to their structure

SOURCE: Vyssokomolekulyarnyye soyedineniya, v. 6, no. 10, 1964, 1778-1784

TOPIC TAGS: polymer, structure, polyalkylchloromethacrylate, methylchloromethacrylate, ethylchloromethacrylate, propylchloromethacrylate, butylchloromethacrylate, dielectric loss, polarization, glass temperature, relaxation, dipole elastic loss

ABSTRACT: The dielectric losses and the polarization of normal polyalkylchloromethacrylates were investigated by measuring the temperature and frequency dependence of $\tan \delta$ and ϵ' for α -methylchloromethacrylate, β -ethylchloromethacrylate, γ -propylchloromethacrylate and δ -butylchloromethacrylate on 100-160 μ thick films. The preparation of the samples and the conditions of measurement are described. For the dielectric measurement of $\tan \delta$ and ϵ' , a temperature range of -170 to 160°C and a frequency range of 20 -- 150 kilocycles were used. The temperature dependence of $\tan \delta$ was studied at 0.4 and 10 kilocycles. At lower frequencies, especially at higher temperatures, the $\tan \delta$ values increase considerably without any change

Card 1/3

L 10757-65

ACCESSION NR: AP4047201

In the nature of the correlation between the dielectric strength and the frequency or temperature. The maxima observed in curves relating frequency to $\text{tg } \delta$ are independent of the temperature. Lengthening of the side chains in polyalkylmethacrylates reduces the relaxation time and the apparent activation energy of the dipole-elastic process, but the width of the τ distribution remains unchanged. The effective dipole moment ($\mu\sqrt{g}$) d.e. of the kinetic unit of the segmental type, calculated for the monomer, decreases with an increasing number of CH_2 groups in the side chain. Its value, as well as the $\text{tg } \delta_{\text{max}}$ of the dipole-elastic losses, approached the analogous values for polyalkylchloromethacrylate with the same number of CH_2 groups in the side chain. This is due to the fact that the motion of the end groups of the side chain becomes increasingly independent of the motion of the carbon backbone. The effect of polar substituents on the relaxation time, activation energy and $\text{tg } \delta_{\text{max}}$ of dipole-elastic losses as a function of their position in the chain was also studied. Introduction of a polar group increases the relaxation time; consequently, the T_c of the polymer also rises, regardless of its position. The apparent activation energy is generally independent of the introduction of polar groups, and is determined by steric factors. Orig. art. has: 5 figures and 3 tables.

ASSOCIATION: Institut'vy sokh molekul'yarnykh soyedineniy AN SSSR (Institute of Macromolecular Compounds, AN SSSR)

L 10757-65

ACCESSION NR: AP4047201

SUBMITTED: 23Nov63

ENCL: 00

SUB CODE: 0C

NO REF SOV: 009

OTHER: 006

Card 13/3

L 37656-65 EFT(c)/EPH/EMP(j)/EWT(m)/T PC-4/PR-4/PS-4 RPL RM/WW

ACCESSION NR: AP4047202

S/0190/64/006/010/1785/1790 29

AUTHOR: Mikhaylov, G.P.; Borisova, T.I.

TITLE: Dipole relaxation of normal polychloroalkylmethacrylates at low temperatures

SOURCE: Vyssokomolekulyarnyye soyedineniya, v. 6, no. 10, 1964, 1785-1790

TOPIC TAGS: dipole relaxation, polymethacrylate, polychloroalkylmethacrylate, dielectric loss angle, permittivity, chlorinated polymer

ABSTRACT: The dependence of the dielectric loss angle and permittivity of poly- α -chloromethylmethacrylate (PC MMA), poly- β -chloroethylmethacrylate (PCEMA), poly- γ -chloropropylmethacrylate (PCPMA) and poly- δ -chlorobutylmethacrylate (PCBMA) on temperature (-60 to -130C) and sonic frequencies was studied, using a published experimental technique (Vysokomol. soyed. v. 6, 1964, 1778). The measurements indicated that three types of molecular motion and corresponding regions of dipole losses are exhibited by the studied polymers. The first elastic region is related to the motion of molecular segments and the second depends on the mobility of COO- groups and is located at approximately 70C for sonic frequencies. The third region, which has been investigated in the present study, is due to the motion of side chain terminals and is observed at approximately -100C. With increasing length of the side chains the interaction

Card 1/2

L 37656-65

ACCESSION NR: AP4047202

between their terminals and the COO- group weakens, causing a decrease in relaxation times and increases in effective dipole moments and $\text{tg } \delta_{\text{max}}$ values. The dependence of $\text{tg } \delta_{\text{max}}$ on temperature is shown in Fig. 1 of the Enclosure. Orig. art. has: 6 figures. 2

ASSOCIATION: Institut vysokomolekulyarnykh soyedineniya AN SSSR (Institute for Macromolecular Compounds, AN SSSR)

SUBMITTED: 23Nov63 ENCL: 01

SUB CODE: MT, OC

NO REF SOV: 006

OTHER: 006

Card 2/3

SAZHIN, Boris Ivanovich; MIKHAYLOV, G.P., prof., red.

[Electrical conductivity of polymers] Elektroprovod-
nost' polimerov. Moskva, Khimiia, 1965. 159 p.
(MIRA 18:9)

MIKHAYLOV, G.P.; BUKSHTEYN, L.I.

Influence of the structure of the monomer unit on the effective dipole moment and intramolecular interaction of some stereoregular polymers. Vysokom. soed. 7 no.5:866-867 My '65. (MIRA 18:9)

1. Institut vysokomolekulyarnykh soyedineniy AN SSSR.

I. 01048-67 EWT(1)/EWT(m)/FWP(1)/T IJP(c) WW/GG/RM

ACC NR: AP6019535

(A)

SOURCE CODE: UR/0190/66/008/006/0969/0979

56
8

AUTHOR: Mikhaylov, G. P.; Borisova, T. I.; Nigmankhodzhayev, A. S.

ORG: Institute of High Molecular Compounds, AN SSSR (Institut vysokomolekulyarnykh soyedineniy AN SSSR)

TITLE: Dielectric relaxation in copolymers of n-butylmethacrylate with styrene

SOURCE: Vysokomolekulyarnyye soyedineniya, v. 8, no. 6, 1966, 969-979

TOPIC TAGS: dielectric property, dielectric material, methacrylate plastic, styrene, *COPOLYMER*

ABSTRACT: Molecular dielectric relaxation and polarization of copolymers of n-butylmethacrylate with styrene (100-19% styrene) were studied in the 140°-290°C range and at frequencies of $20-5 \cdot 10^8$ cps. The object of the work was to examine the effect of the methyl groups in the main chain upon the overall dielectric relaxation of a copolymer and to define the principles which govern dielectric relaxation in copolymers at temperatures of 200°C and more above their glass points. It was found that there is a motion of the C=O groups within an n-butylmethacrylate-styrene copolymer in the glass state. As the content of styrene in the copolymer chain increased, both the relaxation time and the activation energy of the kinetic units gradually declined. On the same time, no additivity was found in the cases of the composition dependence of the copolymer's glass points, activation energy of relaxation, and the maximum dielectric

UDC: 678.01:53+678.13+678.744+678.746

Card 1/2

L 01048-67

ACC NR: AP6019535

relaxation angle. These effects are attributed to the decreasing steric interference of the CH₃-groups in the copolymer main chain. At temperatures of 200°C and more, above the respective glass points, dielectric relaxation time and polarization were found to be independent of the copolymers' composition. It was found that the effective dipole moments of the dipole-group polarization were independent of temperature while the dipole-segmental and static field polarizations were found to decrease linearly with temperature. Orig. art. has: 7 figures, 1 table.

SUB CODE: C7,11/ SUBM DATE: 07May65/ ORIG REF: 011/ OTH REF: 007

awm

Card 2/2

MIKHAYLOV, G.S.; KON'KOVA, V.A.; BASOVA, A.K.

Preparation of ethyl ester of ethoxyacetic acid. Zhur. Priklad. Khim. 25,
1329-30 '52. (MLRA 5:12)
(GA 47 no.22:12243 '53)

1. Leningrad Filial VNIIV.

MIKHAYLOV, G. S.

U S S R .

The isolation of dactalone sorbose in aqueous solution.
A. K. Burova and G. S. Mikhailov. *Trudy Vsesoyuzn.
Nauch.-Issledovatel. Yuzamta. Inst. 4, 94 (1953).--Annota-
tion.*
B. S. Levine

MIKHAYLOV, GS

Improved method of preparation of nicotinamide. G. S. Mikhaylov and A. K. Mitsova. Trudy Vsesoyuz. Nauch. Issledovatel. Vtamin. Inst. 5, 20-7 (1954).—The previous method of prepn. of nicotinamide [Engler, Ber. 27, 1078 (1902)] is improved by using CCl_4 and CHCl_3 in place of H_2O and Me_2CO for extrn. of R₁ nicotinate, preferred to the Me ester; the ester kept 10-12 days with concd. NH_4OH gave 75% nicotinamide. G. M. Kozlovskiy.

RM

MIKHAYLOV, G. S.

Effects of the evaporation products of thermocathode substances, especially barium, on the transformation occurring in metallic oxides during their electronic bombardment. G. S. Mikhaylov. *Zhurnal Fiz. Khim.*, 2, 95-96 (1967).—Metal oxides, like BaO, ZrO₂, ThO₂, CeO₂, CuO, were subjected to an electron bombardment in a tube with the following characteristics: $v_e \sim 800$ v., I_e about 100 ma., pressure $\sim 3 \times 10^{-4}$ mm. Hg, distance between anode and cathode 5 mm.; the carrier metals for the oxides were W, Ta, or Mo. Especially BaO dissociates into Ba and O under electron bombardment; thus there is another effect superimposed onto the heat effect of such bombardment, which latter effect was discovered by Imai, et al. (*C.A.* 49, 10728e). W. J.

8
4E2C

MT 92

MIKHAYLOV, G.S. [Mykhaylov, H.S.]; USIKOV, O.Ya. [Usikov, O.IA.].

Atomic. The dependence of the electron work function and of the metal atomic heats of sublimation. Ukr. fiz. zhur. 2 no.4; 380-382 O-D '57. (MIRA 11:3)

1. Institut radiofiziki ta elektroniki AN URSS.
(Heat of sublimation) (Electron emission) (Metals)

MIKHAYLOV, G.S. [Mykhaylov, H.S.]

Activation of an oxide cathode by oxygen liberated from thin
oxide films on electron bombardment [In Ukrainian with summary in
Russian]. Ukr.fiz.zhur. 3 no.1:112-115 Ja-P '58. (MIRA 11:4)

1. Institut radiofiziki ta elektroniki AN URSR.
(Electron tubes)

AUTHOR: Mikhaylov, G.S.

SOV/100-3-8-2/18

TITLE: Influence of the Evaporation Products of the Thermocathode Material on the Transformations Occurring in Metal Oxides When Subjected to Electron Bombardment
(Vliyaniye produktov ispareniya veschestva terokatoda na prevrashcheniya, proiskhodyashiye v metallicheskih oksidlakh, podvergayemykh elektronnoy bombardirovke)

PERIODICAL: Radiotekhnika i Elektronika, 1958, Vol 3, Nr 8, pp 1040 - 1042 (USSR)

ABSTRACT: In electron tubes with oxide or thorium-oxide cathodes, the particles of the cathode coating are torn off the cathode core by means of the electric field and these are subsequently deposited at the anode or other electrodes. The deposit at the anode is subjected to an intensive electron bombardment. It is therefore of interest to investigate the effect of electron bombardment on these oxide particles. The investigations reported were carried out by means of a special experimental diode which was fitted with a water-cooled, copper anode. The experiments were carried out at the anode voltage of 600 V and the anode current of 100 mA; the initial pressure was

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SOV/109-3-8-9/18

Influence of the Evaporation Products of the Thermo-cathode
Material on the Transformations Occurring in Metal Oxides When
Subjected to Electron Bombardment

$5 \cdot 10^{-6}$ mmHg and the anode-cathode distance was 5 mm. All the cathodes were directly heated and the following cores were used: tungsten, tantalum, molybdenum and tantalum with tungsten powder. The following metallic oxides, in the form of fine powders (grains of 10 μ) were employed: BaO, ZrO₂, TiO₂, CeO₂ and CuO. These were deposited on the anode and bombarded by the cathode current. It was found that above a certain current (about 30 mA, which corresponds to a current density of $5 \cdot 10^{-3}$ A/cm²), the oxide powders were subject to an intense heating. The temperatures thus obtained could reach 2,000 °C. At anode currents below the threshold value, the oxides produced a blue, cathodic luminescence. The author expresses his gratitude to A.Ya. Ulikov and

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SOV/109-3-8-9/18

Influence of the Evaporation Products of the Thermo-cathode
Material on the Transformations Occurring in Metal Oxides When
Subjected to Electron Bombardment

I.D. Truten' for their interest in this work and valuable
advice.

There are 12 references, 8 of which are English,
3 Soviet and 1 French.

SUBMITTED: January 29, 1958

Card 3/3 1. Oxide powders--Bombardment 2. Electron bombardment--Analysis
 3. Electron tubes--Properties

MIKHAYLOV, G.S. [Mykhailov, H.S.]

Comments on the role of barium in the phenomenon of incandescence of metallic oxide particles by electron bombardment.
Ukr.fiz.zhur. 4 no.6:812-813 N-D '88. (MIRA 14:10)

1. Institut radiofiziki i elektroniki AN USSR.
(Metallic oxides) (Barium) (Electron beams)

MIKHAYLOV, G.S.

Growth of crystals with fivefold symmetry. Ukr. fiz. zhur. 5
no. 5:716-718 S-O '60. (MIRA 14:4)

1. Institut radiofiziki i elektroniki AN USSR.
(Crystals—Growth)

9.3120 (1003,1137,1140)

21534
S/109/60/005/010/031/031/XX
E032/E114

26-2531

AUTHORS: Mikhaylov, G.S., Kutovaya, L.A., and Pospelov, L.A.

TITLE: Dependence of the work function of thin films (cathodes) on the ionisation potential of adsorbed atoms

PERIODICAL: Radiotekhnika i elektronika, Vol.5, No.10, 1960, pp. 1658-1662

TEXT: This paper was read at the 9th All-Union Conference on Cathode Electronics in Moscow, October 1959.

Modern quantum theory of adsorption (V.L. Bonch-Bruyevich, Ref.1) looks upon the metal base and the monolayer adsorbed on it as a single quantum mechanical system in which the electron wave functions for the metal base and the adsorbate overlap.

A.I. Ansel'm, (Ref.2), has used these ideas to obtain the following expression for the change in the electron work function when a metal base adsorbs foreign atoms:

$$\Delta \varphi = 4\pi a \sigma_+ - \frac{am^{3/2}e}{\sqrt{2}\pi\hbar^3} \int_{\varphi^*}^{\varphi^* + E_0} w(E') \frac{E' - \varphi^*}{\sqrt{(E_0 - \varphi^*) - E'}} dE' \quad (1)$$

Card 1/4

Dependence of the work function of ...²¹⁵³⁴
S/109/60/005/010/031/031/XX
EO32/E144

In this expression ϕ^* is the work function of the metal base, σ is the surface density of adsorbed positive ions, a is the distance of the induced negatively charged layer due to the positive adsorbed ions, $W(E')$ is the probability for the presence of electrons in the adsorbed layer, E' is the total electron energy in the potential well, and E_0 is the maximum kinetic energy of electrons in the well. The present authors use this theory to investigate the relation between the ionisation potential V_i and the change in the work function $\Delta\phi$ during the adsorption of alkali and alkali-earth metals. Thus, for example, Fig.1 shows V_i and $\Delta\phi$ as functions of the principal quantum number n . Fig.2 shows these two quantities as functions of position in the periodic table. These regularities can be used to predict the change in the work function for adsorbates whose properties are not known in detail. For example, Fig.1a suggests that the change in the work function for Rb should be approximately 2.88 eV. This is confirmed by the extrapolation indicated in Fig.2. In this way, one can predict that the work function of Rb on tungsten is approximately 1.62 eV. The procedure appears to be general and can be applied to other cases.

Card 2/4

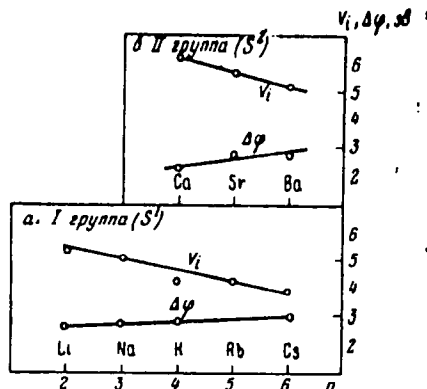
21534

Dependence of the work function.... S/109/60/005/010/031/031/XX
EO32/E114

There are 2 figures, 1 table and 26 references: 10 Soviet and 16 non-Soviet.

SUBMITTED: December 21, 1959

Fig.1



Card 3/4

MIKHAYLOV G S

37185/61/006/003/006/010
U.S.S.R.

9.4250 (1003, 1140, 1385)

AUTHORS Mykhaylov G S, Prishchepko G I, Anisimov N G and
Prishchepko G I

TITLE Pumping action of metallic chromium and a special
feature of its vaporization in a vacuum by electron
bombardment

PERIODICAL Ukrayinskyy fizychnyy zhurnal v 6 no. 3, 1961,
412-414

TEXT In modern sorption pumps, chemically very active metals
(so-called "getters") are used as sorption agents, especially tit-
anium. The use of other metals, like iron, nickel, cobalt, and
chromium as sorbents would be advantageous. The author experiment-
ed with iron, chromium and cobalt. The experiments with iron and
cobalt did not lead to conclusive results, whereas in the case of
chromium an intensive pumping action of the chromium vapor was
established as well as regularly condensed surfaces. The main re-
sults of the experiments with chromium are given in this article

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5/185/61/006/003/006/010
0208/0302

Pumping action.

The distance cathode specimen was approximately 1.5 mm. The high vacuum ($\sim 10^{-6}$ mm Hg) was produced by an oil pump of type MM - 40. During the pumping the lamps were always heated at 400°C for an hour. For purification the metal electrodes were heated to very high temperatures by a current or by electron bombardment. The chromium specimen was heated by electron bombardment to near melting point ($\sim 1800^\circ\text{C}$). At $V_a = 300$ v and $I_a = 100$ ma the specimen attained temperatures of 50 to 100°C below melting point. At that time intensive chromium vaporization took place, accompanied by an increase in the vacuum from 10^{-6} mm Hg to $5 \cdot 10^{-7}$ mm Hg (in both the lamp and the pump). During the experiment the formation of crystals of Cr_2O_3 was observed on the surface of the chromium specimen, these crystals were not destroyed by the electron bombardment and constitute a special feature of the process. The growth of these crystals on the pulverized surface shows that the oxygen, present in chromium as an impurity, remains (during the vaporization) on the specimen in the form of an oxide. This is apparently the reason for the pumping effect of the chromium used (with approximately 10^{-3} weight percent oxygen). The crystal growth on the chromium specimens show

Card 2/3

35099

U/185/62/007/001/00/01
22.9.53.2

26.23TB

AUTHORS: Mikhaylov, I. I., Krasnyakova, N. V., and Khramov, N. V.

TITLE: Ultrahigh vacuum obtained by means of chromium, maintained by electron bombardment

PERIODICAL: Vopr. fizicheskoy khimii, v. 7, no. 1, 1962, 73 - 74

TEXT: In an earlier investigation by the authors (ref. 1: Zh. fiz. khim., v. 3, no. 3, 1961, 413-415) it was shown that chromium pulverized in a high vacuum ($p = 10^{-4} - 5 \cdot 10^{-6}$ mm Hg), acts as a sorbent (getter), almost as powerful as titanium. In the present investigation, the sorbent properties of chromium in an ultrahigh vacuum ($p = 5 \cdot 10^{-8}$ mm Hg) are studied. The results of ref. 1 (op. cit.) cannot be directly extrapolated to such low pressures. The experimental apparatus (lamp and oil pump -40 (17-40)) was very similar to that described in ref. 1 (op. cit.). The experimental lamp was heated for 3 hours before taking the measurements; during that time, the pressure was reduced to 10^{-6} mm Hg. Then the oil - X
Card 1/3

1/185/02/017/01/01/114
020010312

Ultrahigh vacuum obtained by means ...

mium was pulverized by electron bombardment at $V = 10^5$ V and $I = 100$ milliamp. It was found that by pulverization of the chromium, a pressure as low as $P = 5 \cdot 10^{-9}$ mm Hg could be easily obtained. This shows the fairly high rate of evacuation which the chromium develops during the pulverization process. It was estimated that chromium evacuates approximately $5 \cdot 10^4$ liters of air per second at a pressure of $2 \cdot 10^{-9}$ mm Hg. The experimental lamps were either connected to the vacuum pump or connected to it by a valve. In the latter lamps, the pressure could be further reduced, to $5 \cdot 10^{-10}$ mm Hg, by additional pulverization of chromium. As in ref. 1, during the growth of Cr_2O_3 crystals was observed during the electron bombardment, these crystals were not destroyed by the electron bombardment at the high temperature. The oxygen content of the crystals was 0.1 weight percent. In conclusion, the observed "self-purification" effect of chromium, indicates the feasibility of producing ultrahigh vacuum with oxygen impurities, for producing an ultrahigh vacuum of $5 \cdot 10^{-10}$ mm Hg by electron bombardment of the chromium. There are 1 figure and 2 references: 1 Soviet-bloc and 1 non-Soviet-bloc.

Card 2/3

Ultrahigh vacuum obtained by means ...

4/15/82/087/001/001/
0009/0002

ASSOCIATION: Instytut nauki i sztuki technicznej (In-
stitute of Engineering and Technology of the
AS UkrSSR), Kharkiv

SUBMITTED: July 17, 1981

Card 3/3

X

MIKHAYLOV, G.S. [Mykhailov, H.S.]; AKIMOVICH, I.N. [Akymovych, O.M.];
PRONINA, I.G. [Pronina, I.H.]

Production of a superhigh vacuum by means of oxide electronic semi-
conductors pulverized by electron bombardment. Ukr. fiz. zhur. 7
no.12:1367-1368 D '62. (MIRA 15:12)

1. Institut radiofiziki i elektorniki AN UkrSSR, Khar'kov.
(Vacuum) (Semiconductors) (Electron beams)

KHARITONOV, K. F.; MIKHAYLOV, G. S.; GROBIVKER, M. P.

Selenium rectifiers for continuous charging of storage batteries.
Energetik 10 no.8:16-17 Ag '62. (MIRA 15:10)

(Storage batteries)
(Electric current rectifiers)

MIKHAYLOV, G.S.

Note on E.F.Idcnak's article "Effect of the conditions of sublimation
on the optical properties of thin chromium films." Opt. i spektr. 16
no.1:176 Ja '64. (MIRA 17:3)

MINAYLOV, G.S. (MAYLOV, G.S.)
PRESIDENT A, I. I.

1. The first part of the document is devoted to the study of the
with the help of the ...

2. The second part of the document is devoted to the study of the ...

L 47337-66 EWT(m)/EWP(e)/EWP(t)/ETI IJP(c) AT/JG/JD/WH

ACC NR: AR6025746

SOURCE CODE: UR/0058/66/000/004/A071/A071

AUTHOR: Mikhaylov, G. S.; Akimovich, I. N.; Stefanishina, A. V.

TITLE: Obtaining thin films of oxide electronic semiconductors by the method of vacuum condensation with heating of the evaporated substance by electron bombardment

SOURCE: Ref. zh. Fizika, Abs. 4A598

REF SOURCE: Sb. Simpozium. Protsessy sinteza i rosta kristallov i plenok poluprovodnik. materialov, 1965. Tezisy dokl. Novosibirsk, 1965, 22-25

TOPIC TAGS: semiconducting film, condensation reaction, electron bombardment, vacuum technique

ABSTRACT: The possibility was investigated of obtaining thin films of oxide electronic semiconductors with n-type conductivity "synthesized" from oxides of metals of the Ti subgroup of group IV of the periodic system and oxides of rare-earth metals; by the method of evaporation and condensation in vacuum with direct heating of the samples of the evaporated substance by electron bombardment. The initial samples of the substance were obtained by sintering chemically pure oxides in a hydrogen atmosphere or in vacuum (10^{-4} - 10^{-5} mm Hg). Sputtering by electron bombardment was carried out at $V_a \approx 1$ - 2 kv and $J_a \approx 100$ - 200 ma. The evaporation and condensation were carried out under conditions of high vacuum (10^{-5} - 10^{-6} mm Hg) or superhigh vacuum (10^{-7} - 10^{-9} mm Hg). Both isotropic and anisotropic substrates, heated to different temperatures, were used. The properties of the films depend strongly on the produc-

Card 1/2

L 47337-66

ACC NR: AR6025746

tion technique, especially on the vacuum conditions. [Translation of abstract]

SUB CODE: 20

Card 2/2

ACC NR: AP6030497

SOURCE CODE: UR/0275/66/000/006/BO16/BO16

AUTHOR: Mikhaylov, G. S.; Akimovich, I. N.; Stefanishina, A. V.

TITLE: Producing thin films of oxide electronic semiconductors by the method of vacuum condensation with the substance vaporized by electron bombardment

SOURCE: Ref. zh. Elektronika i yeye primeneniye, Abs. 6B104

REF SOURCE: Sb. Simpozium. Protsessy sinteza i rosta kristallov i plenok poluprovodnik. materialov, 1965. Tezisy dokl. Novosibirsk, 1965, 22-25

TOPIC TAGS: semiconducting film, electron bombardment

ABSTRACT: The possibility was studied of producing thin films of oxide electronic semiconductors ("synthesized" from metal oxides of Ti-subgroup, the 4th group of the Periodic System, and from oxides of rare-earth metals) by the method of vaporization and condensation in vacuum, with the vaporization accomplished by electron bombardment. Source specimens were obtained by sintering chemically pure oxides in hydrogen or in vacuum (10^{-4} -- 10^{-6} torr). The electron-gun spraying was performed at $V_a = 1$ -- 2 kv and $I_a = 100$ -- 200 ma. The vaporization and condensation were conducted in high (10^{-5} -- 10^{-6} torr) or superhigh (10^{-7} -- 10^{-9} torr) vacuum. Both isotropic and anisotropic backings heated to various temperatures were used. The film properties strongly depend on the processing, particularly on the vacuum conditions. V. U.
[Translation of abstract]

Card 1/1 SUB CODE: 11, 20

UDC: 621.315.592:548-552:541.49